ACEC-NH/NHDOT
Highway Design Sub-Committee

March Meeting
March 5, 2024
8:00 am – 10:00 am

Meeting Minutes

Attendees

Jim Marshall, NHDOT	Aidan Cleaves, VHB
Ronald Grandmaison, NHDOT	Kyle Higgins, GPI
Corey Spetelunas, NHDOT	Tim Whitney, GPI
Curtis Morrill, NHDOT	Clint Mercer, Jacobs
Hans Weber, NHDOT	Bill Ashford, Kleinfelder
Jonathan Hebert, NHDOT	Brian Colburn, McFarland Johnson
Patrick Colburn, NHDOT	Marty Kennedy, VHB
Sue Guptill, NHDOT	Phil Kendall, HNTB
Bill Caswell, NHDOT	Benjamin Martin, VHB

These meeting minutes are from the March 5, 2024, ACEC-NH/NHDOT Highway Design Sub-Committee Meeting.

Introductory Remarks

Jim Marshall opened the meeting noting that it was primarily intended to be a brainstorming session to identify challenges experienced while using the current CAD/D software, primarily OpenRoads Designer, and ways that the software might be used more effectively and efficiently. The first 45 minutes were dedicated to posting comments, questions and concerns in six different categories described below. The remainder of the time was spent reviewing those comments to expand on them and clarify them when necessary.

The comments not only presented challenges that people experience, but also offered recommendations for handling those challenges.

Discussion of Subject Areas

Following are the topics discussed in the six categories.

1. Software

We often hear that “the software can do that." However, it is not always obvious how difficult it might be to accomplish a particular task.

Operators and managers are often assured improvements and solutions in “the next release." However, that “next release” may not be deployed into production. The last ORD for production users within DOT was two years ago while Bentley sends out new releases two or three times a year. The CAD/D staff test each new release as it becomes available and is finding that the enhancements and

new features available with each one are often overshadowed by new bugs that could be detrimental to our workflow. The most recent release which came out in December has some significant new features we wish to take advantage of so it planned to be deployed by the summer. There was a significant issue hindering deployment which seems to be resolved now. The planned update will be announced at the ACEC conference in April.

Do operators prefer using two windows for design or one? Some have two instances of OpenRoads Designer (ORD) open simultaneously, especially when working on cross-sections; one session for the cross sections and another with the plan view.

Is ORD run from the server or the individual's computer? Which is better? At NHDOT, software is installed locally and files are stored on the server.

Some firms have noticed that ProjectWise (a document management system originally developed by Bentley for CAD/D data) improves load times significantly.

Do people experience remote connection issues? Those using Projectwise noted that there is no difference either way since the data is housed on a cloud server hosted by Bentley and therefore is always remote whether the operator is at home or in their office.

However, some have worked on NY State DOT projects where they needed to connect to that organization's Projectwise server. That was not as smooth as using one hosted by Bentley.

It was noted that creating cross-sections along a line string such as a driveway or stream can be challenging. At one time Bentley provided the ability to create sections along any line, it did not need to be an alignment. Is this no longer the case?

Drainage analysis is hindered by the need to use different software for modeling the proposed system. Libraries for NHDOT drainage structures are not yet fully developed for ORD. Development of those libraries requires specialized knowledge of hydraulic properties of the structures being modeled. Some organizations are designing the proposed drainage systems in StormCAD, HydroCAD or other programs and then reproducing the design in ORD. Since StormCAD is embedded within ORD, it should be more efficient to use than HydroCAD.

A similar situation exists for bridge design. Some design the structure with ORD, some with OpenBridge Modeler and others with ProConcrete. All are Bentley products which specialize in particular areas, but for many tasks can be used interchangeably. While all three products are intended to interact with each other, a design developed with one of them is not necessarily easy to modify with another.

Cross-section annotation is time consuming. Manual edits can be lost if a new section needs to be inserted triggering regeneration of the entire cross-section set. Would it be possible to have different sets of sections – a set along the roadway at the regular interval and a second set with the special stations for driveways, utilities, etc.

Annotation on cross-sections is static and does not automatically update if design is modified.

Sometimes having annotation automatically update is not desired because it could undo manual edits made by the operator. Is it possible to "lock" completed elements so they don't update?

Annotation updates can be time consuming on large projects. There is no way to limit the extent of updates by a station range or select individual cross-sections to update.

It was noted that when plans are changed in AutoCAD, the sections automatically update whereas ORD requires the operator to initiate the annotation update on the sections.

Does data added with Civil Labeler automatically update? This will need to be investigated.

When software updates are deployed, do you update the project to the new version or continue working with the prior version? What happens if a project in an advanced stage of design is updated and the update introduces unforeseen alterations. Many updates to ORD are not backward compatible requiring additional effort to downgrade the drawings or relying on an earlier backup of the files. CAD/D drawings can be opened by nearly any version of MicroStation regardless of which version was last used to edit the drawing.

Sometimes it can be challenging to locate which level to turn off due to nested references where the level might be included in the display multiple times.

Some state DOT's are planning to use ORD exclusively instead of supporting both ORD and MicroStation. NHDOT's CAD/D staff is watching this to see if it might be a viable option for us too. ORD includes all the functionality of MicroStation plus the civil design tools. The negative side of this is that older versions of ORD would not be able to open a drawing if it contains civil elements from a later version. Also, ORD licenses cost twice as much as MicroStation ones so the overall number of licenses would be reduced unless a significant investment is made to purchase an equivalent number of ORD licenses.

Is anyone using Bentley's iTwin? This is a method of storing CAD/D data in a format that can be accessed by a variety of other softwares. Sample uses would be providing data for review by people who do not use MicroStation and ORD. Also, providing data to field personnel for review and comment. The model can be viewed with a program on the user's device or through a web browser. There is the ability to make comments and markups to be transferred back to the designer.

ORD is a very complex tool which has added useful functionality such as utility clash detection and visibility analysis. However, the overall complexity of the product means it has a large learning curve. This is not only challenging when training a new user, but also when someone needs to accomplish a task that they have not done in a long time and need to relearn that process.

Differing opinions on whether learning ORD is more challenging for new, inexperienced users or those who already have considerable experience with other similar software.

Are MicroStation and ORD the right tools for the job? An overwhelming percentage of state DOT's use Bentley products because they all started using CAD/D software at a time when Bentley dominated the market for large civil projects. It is not so prevalent within municipal government or utility companies.

Compatibility with Carlson survey needs to be improved.

Large projects require special considerations. Computers struggle with the large, complicated models. The solution so far has been to break them up into smaller pieces and reference them so they still appear connected. Having a large number of reference attachments for a large project that has been sub-divided also makes the cut sheet process more complicated.

On long projects, the corridors and cross-sections should be broken down into multiple segments. NHDOT considers limiting corridors to about a mile long. Dividing the project also complicates the QC/QA process.

2. Hardware

Hardware is generally underpowered to handle larger projects. ORD still crashing.

What are Bentley's minimum and recommended ORD requirements? Where should investments be made? RAM? Video drivers? Processor speed? Bill Caswell will contact Bentley for advice.

Laptops are not adequate to handle the software and associated models.

Are issues which are perceived as hardware limitations possibly network limitations?

What is the best workstation configuration? Need at least 2 screens – 3 may be better. Does the CAD/D standard workstation need to be redefined?

3. Documentation

Provide notifications when documentation is updated using the same tools (mailing list) for soliciting for projects, etc.

A challenge of preparing documentation is how to present it in a way that an inexperienced person can follow it, but is not excessively detailed for the person who might only need a refresher on how to accomplish the task.

Documentation often lags behind development. Sometimes documents may be out of sync if one procedure is updated while documentation of an associated one is not yet up-to-date.

Documentation should not only present the steps to accomplishing a task, but also explain why it is done in a particular way.

We need clarification of expectations for producing 3D models. What level of precision is expected? Identify areas where the ROI of defining it perfectly is not worth the effort necessary.

What is the best way to document the level of detail and limitations of the 3D model? A group should be formed consisting of designers, construction personnel and contractors to determine this.

Current procedures reflect the old level of detail needed for DOT reviews. Is this still needed? Is some plan data or annotation now irrelevant due to changes in survey layout techniques?

Workspace updates – what's changed this release? Documentation of what changed with workspace updates is generally vague or non-existent.

Can the workspace be documented more thoroughly so consultant CAD/D administrators better understand the thought process behind its development?

Need training on DOT standards?

Documentation applicability for larger projects vs smaller/normal projects. Documentation should describe alternatives if a procedure needs to be done differently due to the size of the project.

Updating several drainage structures vs hundreds

What is the goal of the DOT. To provide 3D CADD files at time of advertisement vs. provided afterwards to A-bidder. If the model is provided at ad time and changes before delivering to the awarded contractor, how are those changes documented?

Sample Plans? Consultants need them but DOT does not have a set available yet.

Suggestions for improving documentation are welcome. Submit comments to Bill Caswell, William.Caswell@dot.nh.gov

4. Construction Plans

Is there a Contractor group for feedback/desires of construction plans? Is too much info being shown/designed for modern context?

How is a 3D model reviewed for constructability?

It was not mentioned during the meeting, but how do we prepare models for projects that are done in phases?

What is NHDOT long-term vision for moving to paperless project delivery of digital plans? What is the vision/goal for having the 3D model as the legal document instead of paper/PDF plan sheets. What do we want to see as a project deliverable in 5-10 years?

How to make the project data manageable for field inspection on a tablet.

How is end user using plans? Construction, Audit, Contractor, Utilities, etc. Determine what end user needs/wants/uses.

Design validation vs what is needed/used in the field? How much design is needed for Contractor to do the work? For example, the time necessary to model a small driveway and its connection to the roadway can be time consuming and may not be necessary for the contractor. On the other hand, that level of precision may be desired for quantity calculations.

What is expectation of what is 3D and what doesn't need to be? Example: ADA sidewalk ramps. There is a standard detail for them, do they need to be modeled?

Remove non-automated dimensioning that is shown elsewhere? Need to discuss potential changes with Construction, Contractors, etc.

Reduce redundant information between various types of plans?

Cross-sections – what level of detail needed?

Drainage profiles – is there a benefit? End user input needed. They are helpful to the people laying out drainage. Utility companies prefer cross sections to assist in identifying conflicts. How to accommodate both? How do other states handle this? Apparently, many provide drainage profiles.

Can plan development checklists be simplified? Are we showing more detail than is necessary for modern construction practices?

Even if a suitable 3D model is provided, the contractor will review the model to look for areas that might result in glitches when uploaded to their equipment. Good documentation of areas where ther are known issues or areas not precisely modeled will save them from having to discover them on their own. No matter how good the model is, the contractor still needs to manipulate the data for their equipment – their paver will require different data from the model than their excavator.

Investigate the use of iTwin technology. Is it a viable method of providing model data to construction staff and contractors? Could it replace paper/PDF plans in some instances?

There are different requirements for different sheets from different bureaus. How can this be documented so CAD/D operators have access to the guidelines for each group?

5. Training

Software has become so complicated that there is a steep learning curve. It can be intimidating to new users.

A sample ORD project which includes sheet generation would be helpful.

More training is needed. Specific topics mentioned included:

- creating profiles and cross sections
- creation of cut sheets (plan, profile and cross-section)
- creating the final plan set for advertising.

Video demonstrations of tasks are helpful and more are requested. More videos are available to DOT personnel than external users due to limitations of posting them on the Department's external

website. That includes both ADA requirements for closed captioning or a transcript of the video and potential size limitations.

Increase frequency of CADD User Group meetings. Monthly? Quarterly? Semi-annually?

6. Other

A group needs to be assembled to recommend and prioritize areas for CAD/D development. It should include both DOT and Consultant members.

Initiate a CAD/D User group w/Consultant lead collaborator? Need more collaboration. Meetings could be a roundtable discussion of a particular topic or presentation/demonstration/mini-training on a topic. Frequency needs to be determined. Some were interested in (virtual?) monthly meetings for more frequent user collaboration and ability to address issues in a timely manner. Others suggested lengthier quarterly meetings. Maybe quarterly meetings alternating between half-day in-person gatherings and shorter virtual meetings which could include additional consultants of representatives of other state DOT's.

Could educational partners (i.e. UNH) include Bentley products in their curriculum? At one time, Bentley offered a student version of MicroStation for educational institutions.

Just because we can, doesn't mean we should. The software has limitless possibilities, but what level of detail do we need?

Additional development staffing is needed to create more/better documentation and to provide training.

What is the long-term goal? Better plan production practices for development of cut sheets or focus on establishing a 3D deliverable?

Determine better methods to improve QC/QA ability for PMs and others.

Summary

This meeting accomplished its intent to document many of the challenges faced by CAD/D users. Additional research will be needed for many of the topics presented here. The next step should be to form a committee consisting of both DOT and consultant staff to prioritize CAD/D development needs and make the best use of the limited resources. That committee should also establish the frequency and format for user group meetings.

Next Meeting – ????

Submitted by:

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CAD/D Section Supervisor

cc: Attendees
Jim Marshall, Administrator